

THE
AMERICAN JOURNAL
OF THE MEDICAL SCIENCES

FOR JULY 1861.

ART. I.—*On Dislocations of the Shoulder-Joint, with a Description of a Novel and Efficient Method of Reduction.* By N. R. SMITH, M. D., Professor of Surgery in the University of Maryland. (With a wood-cut.)

THE anatomical mechanism of the shoulder-joint has remarkable peculiarities. Although classed with ball-and-socket articulations, it can scarcely be said to possess a socket at all, though having a very perfect head. So far as the bones are concerned, it is very imperfectly fortified, being remarkably contrasted in this respect with the hip-joint.

The shoulder-joint is also destitute of proper ligaments, that which is termed the capsular, or orbicular ligament, being little else than a loose synovial capsule, fortified with but few fibrous threads. The extreme mobility of this joint precludes the use of close ligaments, and also deep interlocking of the bones. Nature must therefore resort to adventitious mechanical aids to render secure this important joint.

The extreme mobility of the scapula would, at first thought, seem to be a circumstance of insecurity. It is, however, really quite the reverse, the ready yielding of the scapula defeating the effect of violence exerted on the joint through the humerus. The facile motions of the scapula, effected by its complicated muscular apparatus, enable it to present its shallow glenoid in almost every direction. When the arm is elevated, and sustains a force from above, the glenoid looks upward to oppose it. When we fall upon the hand, laterally, the same cavity presents downward and outward. It is thus capable of almost instantly opposing its surface to the head of the humerus, in whatever attitude it may present itself; thus revolving around it and really, in its mechanism, representing a much deeper cup than that which it exhibits in the skeleton.

Although this joint is destitute of a fibrous capsule, it possesses a substi-

tute wonderfully adapted to its necessities. It has a most effective muscular capsule. Four powerful muscles arising from the scapula embrace the head, and are inserted into its base, the two bicipital tuberosities.

These muscles are far less concerned in the various motions of the joint than in keeping the head of the bone, in all its movements, closely applied to the glenoid cup. They perform, indeed, the office of a powerful contractile capsular ligament. If it were a fibrous resistant capsule, it would be either too loose to support the joint, or so close as to check its useful movements. These muscles are always in action when the extremity is being exercised.

The coracoid and acromial processes, with the coraco-acromial ligament, also adventitiously fortify the joint above, and in the direction in which the head of the bone is most frequently impelled. The tendon of the biceps, passing over the head of the bone, supports the joint in that direction in no small degree. Its continuity with the muscle gives it the character of an elastic and contractile ligament.

Notwithstanding these mechanical advantages peculiar to this joint, it is, owing to its great variety and extent of motion and the powerful leverage of the humerus, more frequently dislocated than any other articulation.

The various dislocations of the humerus illustrate more clearly than those of any other joint, the mechanism of the muscles in the production of luxation. This we should infer from the important part they perform in the offices of the joint.

The part which accidental violence performs in dislocating the shoulder is simply distortion. A person in falling, for instance, has the arm violently abducted—thrown upward against the side of the head. The thin capsule is strained and ruptured below; the muscular capsule, which embraces the head of the bone above, and which should resist dislocation, is relaxed; so also the deltoid. But there are three very powerful muscles which are violently put upon the stretch—the latissimus dorsi, the teres major, and the pectoralis major. By the action of these muscles the head of the bone is drawn violently into the axilla. The action of these muscles at the moment is abnormally violent, because, by the sudden force inflicted upon them, they are provoked to spasmodic action.

That such is the mechanism of this displacement is manifest from the fact that it is often effected by muscular action alone. It is not an uncommon occurrence for the humerus to be dislocated in a paroxysm of epilepsy. Many years ago I knew a lady subject to this malady, who suffered dislocation of the shoulder in almost every paroxysm. In the practice of my father, the late Prof. of Surgery in Yale College, a case occurred in which, in a paroxysm of puerperal convulsions, both shoulders were simultaneously dislocated and remained displaced for a long period of time, owing to the nature of the lesion being unnoticed at the time of its occurrence. In these cases the deltoid violently effects the abduction of the

arm, while the pectoral and latissimus, with equal and sudden force, jerk the head downward into the axilla. This is the result of the want of harmony in the action of the muscles in the abnormal state.

The parts which suffer lesion in displacement are those, of course, which resist dislocation. The most important of these are the four muscles inserted into the bicipital tuberosities. Their fibres are, some of them, very short, and suffer laceration in vainly resisting.

The dislocation of the humerus forward under the coracoid is generally consecutive in relation to the axillary displacement. The head is first forced into the axilla, and then, sometimes the pectoral muscle being more stretched than the latissimus by the humerus being driven backwards as well as outwards, is dragged forward under the coracoid. In other cases it is effected by the inflicting of a blow upon the elbow, transmitting the force in the direction of the length of the humerus, the head of the bone being presented forward at the moment of the distortion.

The backward displacement of the head of the humerus, on the dorsum of the scapula, under the spine of this bone, is rare. I have seen but three cases in an extensive surgical practice of forty years. Only one of these was recent. Such displacement is probably effected by the combined action of two forces. A person falls forward with violence, the elbow encounters the ground, which inflicts a forcible counter-stroke in the direction of the length of the humerus. The arm at the same moment is driven forward upon the breast, rendering tense the latissimus dorsi, the teres major, and the posterior border of the deltoid. Provoked to spasmodic action, they co-operate with the counter-stroke in forcing the head over the border of the glenoid, backward.

It is not my purpose in this article to discuss fully the diagnosis of injuries of the shoulder, but rather to describe a method in some respects peculiar to myself (as I believe) of effecting the reduction of the luxated humerus.

I will remark, however, that I have known dislocation of the scapular end of the clavicle to be mistaken for dislocation of the head of the humerus—also fracture of the neck of the scapula, and fracture of the neck of the humerus—to be taken for the same injury. I have even known dislocation to be mistaken for a fracture of the humerus at the insertion of the deltoid, owing to the remarkable angle which the deltoid makes with the shaft of the bone at that point, when the head is displaced deeply in the axilla.

The mechanism of the reduction of a dislocated bone is, in most respects, similar to that of the dislocation. As muscular force is concerned in the displacement, so is it in the reduction. Accidental violence has been known to reduce a joint dislocated by the same. In Sir Astley Cooper's work on *Fractures and Dislocations* is related a case in which the hip-joint, dislocated years before on the dorsum ilii, was reduced accidentally by violence received by a fall in a storm at sea.

The force employed generally requires to be the converse of that which effected the displacement. Thus, if violent abduction has luxated a member, the opposite movement, or adduction, should effect its replacement, aided by the action of a set of muscles the antagonists of those which were concerned in the displacement. Traction, or extension, is, however, a part of the mechanism of reduction, but not often, if ever, of dislocation. This is a consequence of the overlapping of the bones and shortening of the limb in dislocations. The limb must, in many cases, be elongated in the mechanism of reduction, but not generally so in dislocations.

By far the most common dislocation of the shoulder is that into the axilla. It is not my purpose to give the history of the art of reduction as practised by various surgeons, but merely to describe the method which I have for many years practised and found to be the most efficient.

Extension, counter-extension, and manipulation, constitute the mechanism of the operation of reduction. Counter-extension is the mere fixing, or rendering firm and immovable, the scapula. The head of the humerus alone requires to be relatively moved. The immobility of the scapula effected by counter-extension, is obviously of essential importance. All the movements of the head of the bone, effected in the effort to reduce the same, would merely drag or thrust the scapula loosely about, without changing the relative positions of the head and glenoid.

To effect the immobility of the scapula is the real difficulty in the reduction of this dislocation. In many of the methods practised, the bands employed for this purpose oppose the return of the head of the bone to its place. By some a slit is made in a broad band of stout muslin, the arm carried through it, and one margin of the slit brought into the axilla and the other against the acromion. The tails of the band are carried, one across the breast, the other across the back, horizontally, and are secured to the wall. The lower margin of the slit supports effectually the lower portion of the scapula, but the support of the upper, which is by far the most important, is not well effected. The margin of the band cannot be expected to remain opposed to the thin edge of the acromion. It will either glide over the top of it, or fall beneath it into the depression caused by the dislocation. In the former case it will not support the scapula above, but will allow it to be drawn outward and downward. In the latter case it will, by occupying the cavity to which the head of the bone is to be returned, hinder the reduction.

In effecting counter-extension, it is undoubtedly, in most instances, expedient to apply our resisting bands as directly as possible to the bone from which the other is dislocated. But the difficulty in this case is to effect it without defeating the object in the manner indicated above.

On noticing the mechanical relations of the scapulæ, with their apparatus of muscles, to each other, it occurred to me to make counter-extension from the opposite wrist, an expedient directly at variance with the

commonly received principle, because as remotely as possible from the bone to be supported. There are exceptions to most rules, and I shall endeavour to establish this as one.

Let us observe the continuity of ligament, bone, and tendon by which the two scapulæ are bound together and made mechanically dependent upon each other. Anteriorly the two acromion processes are bound together by an unyielding chain of bone and ligament. The two clavicles, the sternum, and the interclavicular ligament chiefly constitute this bond of union. The fibrous-resistant ligaments in this chain are not capable of being stretched. If traction be made from opposite wrists, the two acromion processes, thus tied together, are not capable of being drawn asunder to the extent of half an inch.

Posteriorly the continuity of resisting parts is almost as perfect. The broad expansions of the scapulæ approach each other not remotely, and they are bound to each other by the interposition of the ligamentum nuchæ, and indirectly by muscles and tendons attached to the spine. Traction from the two extremities will not therefore separate the scapulæ to any considerable extent.

The superior angles of the scapulæ indirectly support each other through the medium of the cervical portion of the spine. The levator muscles, arising from the superior angles of the scapulæ, pass upward to be inserted into the transverse processes.

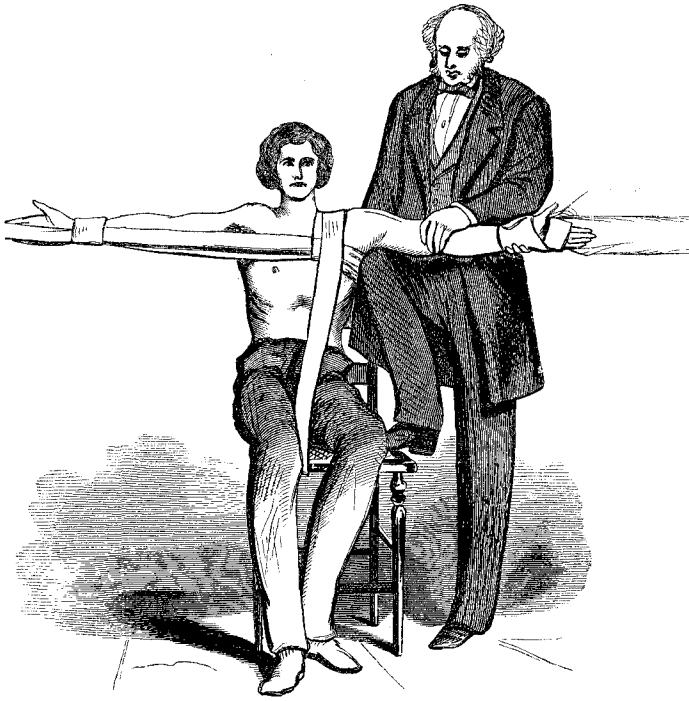
Now the object of counter-extension is to prevent the yielding of the scapula to the tractive force exerted upon the dislocated member. Nothing does this so effectually as the fixing of the opposite scapula by counter-extending from the wrist. Not only is the scapula thus sustained, but the spine erected and prevented from yielding to the tractive force, and becoming curved to the injured side, as invariably happens when counter-extension is chiefly made from the axilla as is usual. Let the experiment be made by allowing a person to incurvate the spine laterally, and then making traction horizontally from the two wrists. The spine will be immediately erected and the two scapulæ will at once assume symmetrical positions. And so in dislocation, the symmetry of the two sides tends at once to be restored. The head and spine are elevated, the two scapulæ firmly sustained, and effect is given, both to the tractive force, and to the necessary manipulation.

In some of the first cases in which I employed this method, I directed simply traction from the two wrists, and I am not now confident that this is not the best method. I placed the patient in a chair and directed two strong persons to make steady horizontal traction from the two wrists. As soon as the spasmodic resistance of the muscles was overcome, the head of the bone was disengaged, and the muscles which help us in such cases, suddenly lifted the head into its place. It will be observed that this method

causes no appreciable pain, but rather relieves the suffering of the patient caused by the pressure of the head of the humerus.

It is now some twenty years since I commenced the use of this method, I am not, therefore, premature in expressing my confidence in it, and recommending it to the profession.

In cases in which, from unusual muscular development, or the age of the dislocation, much resistance is expected, I have modified the application of the counter-extension thus:—



I place the patient in a chair, sitting a little on one side of it, so as to allow room on the side of the injury for the operator's foot. I then pass a piece of stout muslin, folded, around the chest and under the axilla of the injured side. The tails of it I carry horizontally to the opposite side, one in front, the other behind, and extending the arm horizontally, bandage them firmly to the wrist of the sound side, leaving the ends projecting, to be well secured to the wall, or other unyielding substance.

I then pass an ordinary roller over the top of the injured shoulder, and back and forth, twice under the muslin band, to prevent its slipping down. Then I continue the same roller under the bottom of the chair and over the shoulder, three or four times. This helps to give steadiness to the scapula, and especially to prevent the involuntary rising of the patient

from the chair, or the tilting of the scapula upward, when it is necessary to make the manipulation of which I am to speak.

I now attach the extending band to the wrist of the injured side. I am aware that this is counter to the practice of many very eminent surgeons, especially Sir A. Cooper. My reasons are these: First, the wrist furnishes, as we may say, a very convenient handle to the arm. The band employed, if properly attached, does not slip, nor lacerate the integuments. In cases in which no great resistance is expected, it can be conveniently grasped by the hands only of one or two persons. In the next place, this method gives much more mechanical advantage in the way of leverage, in executing the final manipulations by which the head of the bone is thrown into place. It also removes the hands and arms of the assistants further from the patient's chest, and gives the surgeon more free access to the shoulder and more command of the arm.

The principal argument in favour of attaching the extending bands above the elbow is the relaxing, by this method, of the biceps muscle, which, by the complete extension of the forearm, is rendered tense. This disadvantage in my opinion is more than counterbalanced by the advantages mentioned above. The biceps is not capable of insuperable resistance; besides, a certain tension of its tendon, where bound to the head and neck of the bone, is favourable to the reduction, and it is partly the action of this muscle that finally, with a sudden shock, restores the bone to its place. Besides, when the bands are applied above the elbow, the forearm being at right angles, from the form of the arm, if any considerable traction is made, they will invariably slip over the elbow, make very painful pressure on the sensitive parts in the bend of the elbow, and not only cause great suffering, but extend the forearm and thus defeat the object in view, so that the advantage sought is lost, and many disadvantages encountered.

I first apply a wet roller to the wrist, and then attach a muslin band by the clove hitch. Next I direct the extension to be made by two persons, at first outward and a little downward, gradually raising the arm to the horizontal direction, and finally a little above it. The extension must be made gently and steadily—gradually increasing the force, so as not to provoke the muscles to spasmodic resistance. As no pain is created by the force thus employed, it may be continued for a considerable time. The muscles, which at first resist, become fatigued and finally relaxed, and, in a large majority of instances of recent luxation, the head will slip into place without resort to any species of manipulation. I would even continue this traction, where much resistance is encountered, for a quarter of an hour before modifying the force; but, in case the object is not then effected, let the surgeon place his foot on the margin of the chair, and his knee in the axilla. Then let the assistants raise their line of traction above the horizontal as much as possible, and continue it for a moment. The surgeon should then direct that the arm be, by a sudden movement, carried down-

ward while, by extending his foot, he elevates the knee in the axilla. He aids the assistants in this by grasping the arm near the elbow and using it as a lever. If the first effort is not successful, repeat it.

Sometimes I place, on the knee, a ball made by rolling up a bandage, but it is not important. The surgeon can thrust his knee into the axilla so as to avoid much pressure on the marginal muscles of the axilla.

I generally direct those who make the traction to sway the limb horizontally backward and forward, and, grasping it with my hands, at times rotate it a little on its axis, thereby contributing to the disengagement of the head of the bone.

Where the consecutive displacement under the coracoid has occurred, the procedure is nearly the same, except that I make the traction a little more in the direction backward and upward, so as to disengage the head from under the process.

The dislocation upon the dorsum scapulæ, as I have before remarked, I have never seen but in three instances, and only one of those was a recent case justifying the attempt at reduction. It had been dislocated five days, and had resisted an attempt at reduction in the hands of others. The subject was a female, and I could obtain no very satisfactory account of the mechanical mode of the injury. It was easily recognized, there being a tumour beneath the spine of the scapula, as Sir A. Cooper describes, of the size of the hemisphere of a small orange, the limb being shortened and thrown forward. A depression existed under the anterior margin of the acromion. I failed to effect the reduction in the method usually recommended, and which I had deemed the best. I did not then practise extension from the opposite wrist. I made it by carrying the arm through a slit in a sheet. The extension was effected from the wrist, and when continued for some time, I sought to throw the head into place by manipulation—that is, I placed my knee against the back of the neck of the bone, and, swinging the arm backward, endeavoured to prize the head into its place. I repeated the effort several times, but with no satisfactory result.

I then carried a band over the front of the shoulder, one tail under the axilla, the other above it. These I united, carried them backward and inward obliquely, and secured them to the wall. Then I made traction strongly from the wrist almost directly forward. Without much difficulty I thus drew the head of the bone forward over the margin of the glenoid, and had the satisfaction to see it slip into its place.

Much has been said of late of the sufficiency of *manipulation*, to the exclusion of extension, in the treatment of dislocations. By employing new terms, and ignoring the precepts of old surgeons, claims to originality have been set up. Although the term is modern, the method of manipulation has been practised for centuries. It is, in my opinion, ridiculous to throw away the advantages derived from extension for the sake of magnifying the importance of a particular method of manipulation. Mothe, a

long time ago, reduced the dislocation of the shoulder into the axilla by placing the patient in a supine position, and carrying the arm outward and finally upward, parallel with the head and neck, making traction at the same time.

It is well known that a recent dislocation into the axilla, may sometimes be reduced by placing the knee in the axilla, one hand being placed on the shoulder, and the other using the humerus as a lever.

The supine position of the patient on a table is a very convenient arrangement in all dislocations of the shoulder, and is well calculated to promote the efficiency of the method which I recommend. I am not sure that it is not the very best, especially when chloroform is employed.

It will be observed, then, that I advise the combination of traction and manipulation. It would be as absurd to reject traction in all cases of dislocation, as it would be to attempt the reduction, by manipulation alone, of the fractured femur, where overlapping and shortening had occurred.

I will, at a future time, furnish for this Journal several cases illustrative of the method I have adopted. I will here state, however, that I have, by this mode, repeatedly reduced the dislocation of the shoulder which was two months old, and once when three months had elapsed. My class in the University of Maryland, in February last, witnessed the reduction of a dislocation on a muscular man some ten days after the injury. Repeated attempts had been unsuccessfully made, and the integuments had been much chafed. The extension and counter-extension were continued in the mode which I have described, for about five minutes, and then, by a slight effort, the knee being in the axilla, the head was thrown into its place. Scarcely any pain was inflicted.

In cases in which I expect great resistance I commonly employ chloroform. Whatever may be the propriety of using this agent for purely anæsthetic purposes in minor surgery, there can be no question of the propriety of resorting to it in difficult dislocations, inasmuch as we have two objects in view, the one immunity from pain, the other, relaxation of the muscles. The effect of the agent, however, must be rendered very complete, for the incomplete use of it causes spastic rigidity of the muscles and defeats the object.

I was not long since called to a case in a very muscular man by a friend, who had attempted the reduction unsuccessfully, having given chloroform. He had used it cautiously and not with full effect. I then gave it freely, till relaxation was complete, and accomplished the reduction with perfect ease.